

+ PSI Gas Grids and Pipelines

# PSI ganesi Operational Gas Grid Simulation

## Usage

The managing and monitoring of gas transport and distribution networks is extremely demanding on operating personnel. To assist dispatchers in carrying out these centralized tasks, network control systems (e.g. PSIcontrol/Gas) are used. Analysing the process data transmitted by telecontrol, these systems display images that assist operators in knowing exactly what is occurring within the grid. Operational transient gas grid simulation offers multiple functions for grid control and grid monitoring. For example, data for network points where no measured values are available can be determined which is useful for as-sessing gas transport conditions.

## Advantages

Implementation of a transient gas grid simulation system – with current measurement data and future offtakes and/or intakes – enables the following tasks to be performed:

- Gas quality and gas origin tracking
- Pig tracking

- Determination of non-measured process states
- Plausibility check of measured process values (measured value monitoring)
- Network content calculation
- Leak detection / leak location
- Warning of future critical process states
- Determination and testing of future grid control strategies.

## Procedure

Operational gas grid simulation enables the calculation of flow conditions in gas grids. It is a transient calculation, meaning that temporal changes in flow states are correctly taken into account.

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Simulation input data includes intakes, offtakes, calorific values, pressure values and valve positions. Depending on the type of simulation, data can either be measured data (historical values and current values) or forecast and disposition values (future values).

## Simulation types

Operational gas grid simulation includes the following types of simulation:

- **Real-time simulation**  
Determination of pressures, calorific values, flow and quantity data in the entire gas transport grid as well as verification of measured data.
- **Cyclic forecast simulation**  
Automated, early determination and detection of future critical states in the supply area.
- **„What-If“ Simulation**  
When necessary, any critical situation scenario in the supply area can be configured, parameterized as well as analysed. Forecast simulation determines suitable control measures to remedy these scenarios.
- **Post-calculation simulation**  
Implemented operating modes can be subsequently analysed and, if necessary, verified by alternative operating modes.
- **Maintenance simulation**  
Maintenance simulation is used to check scheduled maintenance measures along within the gas grid.
- **Repair reconstruction**  
After correcting a faulty database, the current state can be calculated without interruption. The newly determined network states are then corrected in the archive.

## Integrated simulation

Operational simulation is fully integrated within PSIcontrol/Gas. For example, data management is entirely carried out in PSIcontrol/Gas. All simulation operating dialogs are exclusively PSIcontrol/Gas dialogs including the functions for creating simulation topology. The standard graphs can also be used for the visualisation of calculation results. Hence a uniform user interface for the entire system is available.

The advantages of integrated simulation vs. stand-alone simulation are:

- If required, simulation results can be used as replacement values for faulty measured values.
- Continuous monitoring of the gas grid including event logging and alarming is also possible for segments without measured values.
- All simulation-relevant inputs (commands, setpoints etc.) are also automatically recorded as simulation inputs. Thus the risk of errors (multiple inputs) which exists with a stand-alone simulation is eliminated.
- All limits required by simulation are provided automatically by the real-time database or from other components (forecast, disposition).
- Maximum, error-minimizing system support for data modeling, especially when linking SCADA objects with network topology objects.
- A uniform user interface is available for the entire system.

Operational gas grid simulation a sub-function of our product PSIGanesi/Simulation and Reconstruction. The exchange of network topologies and data between the different applications is supported.

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